

The problem, in a triangle to describe three circles each of them touching the two others and also two sides of the triangle, has been termed after the Italian geometer, by whom it was proposed and solved, Malfatti's Problem. The problem to which the author refers as Steiner's extension of Malfatti's Problem, is as follows: "To determine three sections of a surface of the second order, each of them touching the two others, and also two of three given sections of the surface of the second order," a problem proposed in Steiner's memoir 'Einige Geometrische Betrachtungen,' Crelle, t. i. The geometrical construction of the problem in question is readily deduced from that given in the memoir just mentioned for a somewhat less general problem, viz. that in which the surface of the second order is replaced by a sphere; it is for the sake of the analytical developments to which the problem gives rise that the author proposes to resume here the discussion of the problem. The following is an analysis of the present memoir:—

§ 1. Contains a lemma which appears to the author to constitute the foundation of the analytical theory of the sections of a surface of the second order.

§ 2. Contains a statement of the geometrical construction of Steiner's extension of Malfatti's problem.

§ 3. Is a verification, founded on a particular choice of co-ordinates, of the construction in question.

§ 4. In this section, referring the surface of the second order to absolutely general co-ordinates, and after an incidental solution of the problem to determine a section touching three given sections, the author obtains the equations for the solution of Steiner's extension of Malfatti's problem.

§ 5. Contains a separate discussion of a system of equations, including as a particular case the equations obtained in the preceding section.

§§ 6 & 7. Contain the application of the formulæ for the general system to the equations in § 4, and the development and completion of the solution.

§ 8. Is an extension of some preceding formulæ to quadratic functions of any number of variables.

3. "On the Tides, Bed and Coasts of the North Sea or German Ocean." By John Murray, Esq. Communicated by George Rennie, Esq., F.R.S. Received March 20, 1852.

The author commences his paper by remarking that great similarity of outline pervades the western shores of Ireland, Scotland and Norway, and then observes that the great Atlantic flood-tide wave, having traversed the shores of the former countries, strikes with great fury the Norwegian coast between the Lafoden Isles and Stadland, one portion proceeding to the north, while the other is deflected to the south, which last has scooped out along the coast, as far as the Sleeve at the mouth of the Baltic, a long channel from 100 to 200 fathoms in depth, almost close in shore, and varying from 50 to 100 miles in width. After describing his method of con-

touring and colouring the Admiralty chart of the North Sea, he traces the course of the tide-wave among the Orkney and Shetland Islands along the eastern shores of Scotland and England to the Straits of Dover, and along the western shores of Norway, Denmark and the Netherlands, to the same point. He then remarks that the detritus arising from the continued wasting away of nearly the whole line of the eastern coasts of Scotland and England, caused by the action of the flood-tide, is carried by it, and at the present day finds a resting-place in the North Sea; and that this filling process is increased by the sand, shingle, and other matter brought through the Straits of Dover by the other branch of the Atlantic flood-tide. Hence, he remarks, the gradual shoaling of this sea, and the formation of its numerous sand-banks; the silting up the mouths of the Rhine, the Meuse, and the Scheldt; the formation of the numerous islands on the coast of Holland, that country itself, and much of Belgium; the deposits at the mouth of the Baltic, the islands in the Cattegat, and indeed the whole country of Sleswig, Denmark and Jutland.

The author then takes a view of the tides, and their effects upon the Baltic and its shores before the course of the tide-wave was checked by these shoals and low lands. He considers that, previous to these great changes, the flood-tide entering the North Sea between Norway and Scotland, would make directly towards the German coast, and necessarily heap up the waters in the Baltic considerably above their present level, and that a great part of Finland, Russia, and Prussia bordering upon that sea, would thus every twelve hours be under water, in the same way as the waters now rise in the Bay of Fundy, at Chepstow, and other places, much above their ordinary level in the open sea; that the current outward, on the receding of the tide which these accumulated waters would occasion, combined with the rivers which fall into the Baltic, when checked by the following flood-tide, would cause deposits in the form of a bar tailing towards Sweden; and that an increase to these deposits would form shoals, drifts and islands, and eventually a long sand-bank in outline, like the country of Denmark. He further considers that the tide being by these means prevented from entering the Baltic, may account for the subsidence of the waters of the Gulf of Bothnia better than can the upheaval of the northern part of Scandinavia.

The author then remarks that the great shoal of the North Sea is the Dogger Bank, and that its peculiar form is produced by the meeting of the cotidal waves, of which he traces the course. After bearing testimony to the value of the Admiralty chart of the southern portion of the North Sea, made under the direction of the late Captain Hewitt, he reverts to the importance of contouring such maps, in order to obtain something like a correct notion of the bottom of the sea; and in conclusion expresses a hope that the Admiralty will be induced to continue the survey of the North Sea, so well begun by Captain Hewitt.